

# 18: The Normal Distribution

Stat 120 | Fall 2025

Prof Amanda Luby

Suppose weights of newborn babies in one community are normally distributed with a mean of 7.7 pounds and a standard deviation of 1.25 pounds

1. Use the 95% rule to sketch a graph of this normal density curve. Include a scale with at least three values on the horizontal axis.

2. Suppose I wanted to know the percent of newborns weighing less than 4.5 pounds.

- (a) Use StatKey to answer this question
- (b) Use the `pnorm` function to answer this question.

Answer: \_\_\_\_\_

3. Suppose I wanted to know the 15th percentile of the distribution.

- (a) Use StatKey to answer this question
- (b) Use the `qnorm` function to answer this question.

Answer: \_\_\_\_\_

4. APM Research Lab ran a [survey of likely Minnesota voters](#) between Sept 16-18 of this year. Here's an excerpt from their methodology report:

*The margin for error, according to standards customarily used by statisticians, is no more than  $\pm 3.5$  percentage points. This means that there is a 95% probability that the “true” figure would fall within that range if all voters were surveyed. The margin for error is higher for any subgroup, such as a gender or age grouping.*

They reported 48.4% in support of the Harris/Walz ticket, and 43.3% in support of the Trump/Vance ticket.

(a) How do you feel about this summary of a confidence interval (for a public/non-statistician audience)?

(b) What is the standard error for each of these estimates?

(c) Build a 95% confidence interval for one of these proportions

(d) Use the normal distribution to instead build a 99% confidence interval for one of these proportions

The report also says:

*Overall margin of error = 3.5 percentage points (and therefore approximately 7 percentage points for the difference between two data points)*

- (d) Use this information to build a 90% confidence interval for the *difference in proportions* between the Harris/Walz supporters and the Trump/Vance supporters.

**5. True or False?**

- (a) The central limit theorem says that the population distribution is approximately normal if the population is big enough.
- (b) The central limit theorem says that the sampling distribution for the mean of a random sample is approximately normal if the sample is big enough.
- (c) The central limit theorem says that the sampling distribution for the mean is only normal if the population distribution is normal.
- (d) The central limit theorem says that any statistic is normally distributed if the sample size is big enough.
- (e) The central limit theorem applies to proportions and means

**5. Using `pnorm` or `qnorm`, find the following quantities.**

- (a)  $P(Z < .25)$
- (b)  $P(Z > 1.5)$
- (c)  $P(-.5 < Z < 1.5)$
- (d)  $z^*$  where  $P(Z < z^*) = .33$
- (e)  $z^*$  where  $P(Z > z^*) = .33$
- (f)  $P(X < 10)$  where  $X \sim N(15, 22)$
- (g)  $P(X > 40)$  where  $X \sim (15, 22)$